EXHIBIT 1

Curriculum Vitae   Patrick Juola

(412)999-4761   **Email: pjuola@gmail.com**

RESEARCH INTERESTS

- Machine Learning and Natural Language Processing
- Forensic Linguistics
- Cybersecurity
- Authorship Analysis and Profiling
- Digital Humanities
- Ethics in Science, Technology, and Law

EDUCATION

Ph.D. in Computer Science   April 1995
University of Colorado at Boulder, Boulder, Colorado

M.S. in Computer Science   May 1991
University of Colorado at Boulder, Boulder, Colorado

Certificate (MS equivalent) in Cognitive Science   May 1993
University of Colorado at Boulder, Boulder, Colorado

B.S. in Electrical Engineering and Mathematics   December 1987
The Johns Hopkins University, Baltimore, Maryland

ACADEMIC EXPERIENCE

Joseph A. Lauritis, C.S.Sp. Chair in Teaching and Technology
Duquesne University (2020 – Present), Pittsburgh, Pennsylvania.

Professor of Computer Science
Duquesne University (2014 – Present), Pittsburgh, Pennsylvania.

Director, Evaluating Variations in Language Laboratory
Duquesne University (2010 – Present), Pittsburgh, Pennsylvania.

Associate Professor of Computer Science
Duquesne University (2004 – 2014), Pittsburgh, Pennsylvania.

Assistant Professor of Computer Science
Duquesne University (1998 – 2004), Pittsburgh, Pennsylvania.

Tutor, St. Hugh's and Lincoln Colleges,
Oxford University (1996 – 1998), Oxford, UK.

Postdoctoral Research Associate
> Department of Experimental Psychology, Oxford University (1995 – 1998), Oxford, UK

Instructor
> University of Colorado at Boulder (1990 – 1994), Boulder, Colorado.

NON-ACADEMIC EXPERIENCE

National

Founder and Director of Research, Juola & Associates
> (2010 – Present), Pittsburgh, Pennsylvania.
> A Pennsylvania-based startup specializing in forensic text analysis.

Visiting Scientist, CERT/CC, Carnegie Mellon University
> (1999 – 2001), Pittsburgh, Pennsylvania.

Staff Scientist, PGP, Inc.
> (1995 – 2001), Boulder, Colorado.

Software Engineer, Brain and Cognitive Sciences Dept., MIT
> (1990), Cambridge, Massachusetts.

Technical Consultant, AT&T Bell Laboratories
> (1987 – 1990), Holmdel, New Jersey.

International

CIRCA Scholar, Canadian Institute for Research Computing in the Arts, University of Alberta
> (2011 – Present), Alberta, Canada.

Contributing Editor, PCSense Magazine
> (1995 – 1997), Oxford, United Kingdom.

NSF Fellow, Electrotechnical Laboratory
> (1991), Tsukuba, Japan.

PAID SERVICE

2011-present: Juola & Associates
2022-present: Jewish Community Center, Pittsburgh, Introductory Taiji (T'ai Chi) instructor
2016-2019: Community College of Allegheny County, Introductory Taiji (T'ai Chi) instructor

PEER-REVIEWED ARTICLES

Lukin, E., Roberts, J. C., D. Berdik , E. Mugar, P. Juola. "Adverbs and Adjectives as Stylometric Analysis Parameters." *Revisiting Authorship Attribution: A Special Issue of International Journal of Digital Humanities*

Juola, Patrick. "Verifying Authorship for Forensic Purposes: A Computational Protocol and Its Validation." *Forensic Science International* (2021): 325, 110824

Ainsworth, Janet and Patrick Juola. "Who Wrote This: Modern Forensic Authorship Analysis as a Model for Valid Forensic Science." *Washington University Law Review* (2019):96(5).

Juola, Patrick, George K. Mikros, and Sean Vinsick. "A Comparative Assessment of the Difficulty of Authorship Attribution in Greek and in English." *Journal of the American Society of Information Science and Technology (JASIST)* 70. (2018): 61-70.

Juola, Patrick, George K. Mikros, and Sean Vinsick. "Correlations and Potential Cross-Linguistic Indicators of Writing Style." *Journal of Quantitative Linguistics* 5. (2018): 77-94.

Juola, Patrick. "Authorship Attribution, Constructed Languages, and the Psycholinguistics of Individual Variation." *Digital Scholarship in the Humanities 33*, no. 2 (2019):327-335

Juola, Patrick. "Measuring Style: Document Analysis and Forensic Stylometry." *The Forensic Examiner* (2016):

Fridman, Lex, Ariel Stolerman, Sayandeep Acharya, Patrick Brennan, Patrick Juola, Rachel Greenstadt, Moshe Kam. "Multi-Modal Decision Fusion for Continuous Authentication." *Computers & Electrical Engineering* 41. (2015): 142–156.

Juola, Patrick. "The Rowling Case: A Proposed Standard Analytic Protocol for Authorship Questions." *Digital Scholarship in the Humanities* (2015):

Juola, Patrick. "Stylometry and Immigration: A Case Study." *Journal of Law & Policy* 21. (2013): 287-298.

Juola, Patrick, John I Noecker Jr., Ariel Stolerman, Michael V Ryan, Patrick Brennan, Rachel Greenstadt. "Keyboard Behavior Based Authentication for Security." *IT Professional* 15. (2013): 8-11.

Juola, Patrick. "Large-Scale Experiments in Authorship Attribution." *English Studies* 93. (2012): 275-283.

Juola, Patrick, John I. Noecker Jr, and Michael Ryan. "Authorship Attribution and Optical Character Recognition Errors." *Traitement Automatique des Langues (TAL)* 53. (2012): 101-127.

Juola, Patrick. "JGAAP: A System for Comparative Evaluation of Authorship Attribution." *Proceedings of the Chicago Colloquium on Digital Humanities and Computer Science* 1. (2009):

Juola, Patrick. "Killer Applications in Digital Humanities." *Literary and Linguistic Computing* 23. (2008): 73-85.

Juola, Patrick, John Sofko, and Patrick Brennan. "A Prototype for Authorship Attribution Software." *Literary and Linguistic Computing* 21. (2006): 169-178.

Juola, Patrick and Harald Baayen. "A Controlled-Corpus Experiment in Authorship Identification by Cross-Entropy." *Literary and Linguistic Computing* 20. (2005): 59-67.

Juola, Patrick. "The Time Course of Language Change." *Computers and the Humanities* 37. (2003): 77-96.

Juola, Patrick. "Double Dissociations and Neurophysiological Expectations." *Brain and Cognition* 43. (2000): 257-262.

Plunkett, Kim and Patrick Juola. "A Connectionist Model of English Past Tense and Plural Morphology." *Cognitive Science* 23. (1999): 463-490.

Juola, Patrick. "Measuring Linguistic Complexity: The Morphological Tier." *Journal of Quantitative Linguistics* 5. (1998): 206-213.

Juola, Patrick. "On Psycholinguistic Grammars." *Grammars* 1. (1998): 15-31.

Juola, Patrick. "Machine Translation and Lojban." *Ju'i Lobypli* 8. (1989):

BOOK CHAPTERS

Juola, Patrick , "Algorithmic Complexity.", Encyclopedia of Big Data. Springer, 2022.

Juola, Patrick, "Authorship Analysis and Attribution.", Encyclopedia of Big Data. Springer, 2022.

Juola, Patrick , "Blockchain.", Encyclopedia of Big Data. Springer, 2022.

Juola, Patrick , "Corpus Linguistics.", Encyclopedia of Big Data. Heidelberg: Springer International Publishing, 2022.

Juola, Patrick , "Data Integrity.", Encyclopedia of Big Data. Springer, 2022.

Juola, Patrick , "De-Identification, Re-identification.", Encyclopedia of Big Data. Springer, 2022.

Juola, Patrick , "Ensemble Methods.", Encyclopedia of Big Data. Springer, 2022.

Juola, Patrick , "Google Books N-grams.", Encyclopedia of Big Data. Heidelberg: Springer International Publishing, 2022.

Juola, Patrick , "History.", Encyclopedia of Big Data. Springer, 2022.

Juola, Patrick , "Profiling.", Encyclopedia of Big Data. Springer, 2022.

Juola, Patrick , "Data Profiling.", Encyclopedia of Big Data. Springer, 2022.

Juola, Patrick , Jiří Milička, and Petr Zemánek, "Authorship, Time and Genre Attribution of Arabic Texts Using JGAAP.", Intelligent Natural Language Processing: Trends and Applications. Springer, 2018.

Juola, Patrick , "Thesaurus-Based Semantic Similarity Judgments: A New Approach to Authorial Similarity?", Drawing Elena Ferrante's Profile. Padova, Italy: University of Padova Press, 2018.

Juola, Patrick, Jiří Milička, and Petr Zemánek, "Authorship and Time Attribution of Arabic Texts Using JGAAP.", Intelligent Natural Language Processing: Trends and Applications. Springer Publishers, 2018.

Vescovi, Darren and Patrick Juola, "Analyzing Stylometric Approaches to Author Obfuscation.", Research Advances in Digital Forensics VII. Heidelberg: Springer, 2011.

Juola, Patrick , "Authorship Attribution and the Digital Humanities Curriculum.", Literary Education and Digital Learning: Methods and Technologies for Humanities Studies. Aalborg University Press, 2010.

Juola, Patrick , "Assessing Linguistic Complexity.", Language Complexity: Typology, Contact, Change. Amsterdam: John Benjamins Press, 2008.

Juola, Patrick , "Questioned Electronic Documents: Empirical Studies in Authorship Attribution.", Research Advances in Digital Forensics II. Heidelberg: Springer, 2006.

Plunkett, Kim and Patrick Juola, "A connectionist model of English past tense and plural morphology.", Connectionist Psycholinguistics. Westport, CT: Ablex Publishing, 2001.

Juola, Patrick and Kim Plunkett, "Why double dissociations don't mean much.", Exploring Cognition: Damaged Brains and Neural Networks. Philadelphia, PA: Psychology Press/Taylor Francis, 2000.

Juola, Patrick , "Corpus-based acquisition of transfer functions using psycholinguistic principles.", New Methods in Language Processing. London: UCL Press, 1997.

SELECTED PROCEEDINGS

Juola, Patrick and Johanna Byszuk. 2023. "Drafting Standards for Stylometry." Pre-Conference Workshop and Tutorial. *Digital Humanities 2023.* University of Graz, Austria.

Juola, Patrick , "Forensic Linguistics: Lessons from the Forensic Documents Examination Consensus Standards." *16th Biennial Conference of the International Association for Forensic and Legal Linguistics (IAFLL)* (2023): Manila, Phillipines.

Manning, Theodore, Eugenia Lukin, Ross Klein and Patrick Juola. "Construction & Analysis of a Map-Based Corpus for Tracking Linguistic Variation & Demographic Characteristic Identification. *Proc. Qualico (2023).* Lausanne, Switzerland.

Juola, Patrick and Alejandro J. Napolitano Jawerbaum: "A Comparative Analysis of Authorship Attribution in a Creole and Non-Creole Language." *Proc. Qualico (2023).* Lausanne, Switzerland.

Fang, Michael, Alex Napolitano Jawerbaum, David Berdik, and Patrick Juola. 2023. "The Python Graphical Authorship Attribution Program (PyGAAP)." *Keystone DH 2023*. The Johns Hopkins University's Center for Digital Humanities. Baltimore, MD.

Roberts, J. Cooper, Alejandro J. Napolitano Jawerbaum, Alysa Zhao, and Patrick Juola. 2023. "Too Many J. Smiths: Developing a model for binary publication disambiguation with the Java Graphical Authorship Attribution." Program. *Keystone DH 2023*. The Johns Hopkins University's Center for Digital Humanities. Baltimore, MD.

Manning, Teddy, Genia Lukin, Ross Klein, and Patrick Juola. 2023. "Map Lemon: A Citrusy Approach to Demographic Identification & Tracking Individual Token Use Using a Map-Based Corpus."*Keystone DH 2023*. The Johns Hopkins University's Center for Digital Humanities in Baltimore, MD.

Juola, Patrick. "Stylometry: A Need for Standards." Proceedings of *the 10th Language & Technology Conference.* Poznań, Poland, 2023.

Napolitano Jawerbaum, A.J. and Patrick Juola. "Seychellois Creole". *DH_BUDAPEST_2022 & DARIAH Days Digital Humanities Conference* (2022). Budapest, Hungary.

Fang, Michael and Patrick Juola. 2022. "Authorship attribution of modern Chinese poetry using a character composition-based approach." *Digital Research Data and Human Sciences Conference (DRDHum 2022).* Jyväskylä, Finland.

Manning, Theodore Daniel , Eugenia Lukin, Ross Klein, James Cooper Roberts, Eliana Mugar, Michael Fang and Patrick Juola., "Construction and Analysis of a Stylometric Map-Based Corpus for Tracking Individual Token Use and Demographic Characteristic Identification." *Digital Humanities Unbound* (2022):

Juola, Patrick , "How Much Overlap Means Plagiarism? A Controlled Test Corpus." 8th European Conference on Academic Integrity and Plagiarism (2022):

Fang, Michael, *et al.* "Authorship Attribution of Modern Chinese Poetry using a Character Composition-Based Approach." *Digital Research Data and Human Sciences (DRDHum) - Diversity of Methods and Materials* (2022):

Juola, Patrick. "Unreliable (Linguistic) Evidence and the Role of Standards." *Proceedings of the 4th European Conference of the International Association for Forensic and Legal Linguistics (IAFLL)* (2022):

Napolitano Jawerbaum, Alejandro Jorge, and Patrick Juola. "Coauthored Documents Are More Than Mixtures of the Styles of the Component Authors." *Proceedings of the 4th European Conference of the International Association for Forensic and Legal Linguistics (IAFLL)* (2022):

Juola, Patrick. "How Much Overlap Means Plagiarism? A Controlled Test Corpus." *Proceedings of the European Conference on Academic Integrity and Plagiarism (ECAIP 2022)* (2022):

Napolitano Jawerbaum, Alejandro Jorge, and Patrick Juola. "Carmen Mola and Stylometry of Gender." *Proceedings of DH Unbound 2022* (2022):

Manning, Theodore Daniel, *et al.* "Construction and Analysis of a Stylometric Map-Based Corpus for Tracking Individual Token Use and Demographic Characteristic Identification." *Proceedings of DH Unbound 2022* (2022):

Napolitano Jawerbaum, Alejandro J., and Patrick Juola. "Co-authorship in Carmen Mola, A Case Study." *Proceedings of JADT 2022* (2022):

Juola, Patrick. "Standards, the Standards-Making Process, and their Relevance to Stylometry." *Proceedings of Digital Humanities 2022 (DH 2022)* (2022):

Riddell, Allen, Haining Wang, and Juola, Patrick. "A Call for Clarity in Contemporary Authorship Attribution Evaluation." *Proceedings of the International Conference on Recent Advances in Natural Language Processing (RANLP 2021)* (2021): 1174-1179

Roberts, J. C. and P. Juola and D. Berdik. "Adverbial Placement for Stylometry." *Corpus Linguistics International Conference 2021 (CL 2021)* (2021):

Juola, Patrick. "COVID-19, Linguistic Complexity, and the Accumulation of Scientific Knowledge." *Corpus Linguistics International Conference 2021 (CL 2021)* (2021):

Juola, Patrick. "Who is Watson? A stylistic exploration of narrative voice." *Meeting of the Poetics and Linguistics Association (PALA 2021)* (2021):

Roberts, J. C.. "Adverbial Placement for Stylometry." *Proceedings of Keystone DH 2021.* (2021):

Juola, Patrick. "The Information Content of Machine Translation." *QUALICO 2021* (2021):

Vinsick, Sean, David Berdik, and Patrick Juola. "Best Practices in Authorship Attribution in Greek." *ACH 2019* (2019):

Juola, Patrick. "Large-Scale Accuracy Benchmark Results for Juola's Authorship Verification Protocols." *Digital Humanities 2018: Book of Abstracts/Libro de resúmenes. (2018).*

INVITED ARTICLES/REVIEWS

Juola, Patrick. "Authorship Studies and The Dark Side of Social Media Analytics." *Journal of Universal Computer Science 26.* (2020): 156-170.

Ainsworth, Janet and Patrick Juola. "Who Wrote This? Modern Forensic Authorship Analysis as a Model for Valid Forensic Science." *Washington University Law Review 96* (2019):1159

Juola, Patrick. "One Word, One Module?" *Cortex 39.* (2003): 135-137.

Juola, Patrick. "Encapsulating Architecture and Encapsulating Processes." *Behavioral and Brain Sciences 25.* (2003): 759-759.

SELECTED GRANTS

Funded

2021: Peters, M. et al. Partenariat universitaire sur la prévention du plagiat (PUPP), Co-Principal Investigator, Social Sciences and Humanities Research Council (SSHRC-Canada).

2018: Juola, P. & Riddell, A., SaTC: CORE: Small: Collaborative: Defending Against Authorship Attribution Attacks, Principal Investigator, GOV-National Science Foundation (NSF).

2014: Juola, P. Direct Assessment of Authorial Likelihood Using Bayes' Theorem and Monte Carlo Simulation, Principal Investigator, Innovation Works.

2012: Stowell, D. & Juola, P., Is That You, Mr. Lincoln? Applying Authorship Attribution to the Early Political Writings of Abraham Lincoln, Principal Investigator, GOV-National Endowment for the Humanities.

2010: Juola, P. SDCI Data: Improvement: Java Graphical Authorship Attribution Program (JGAAP), Principal Investigator, GOV-National Science Foundation (NSF).

2008: Juola, P. & Argamon, S., CRI: CRD: Collaborative Research: Community Resources for Authorship Attribution Research, Principal Investigator, GOV-National Science Foundation (NSF).

PATENTS

- A method of classifying images of coral to determine its state of health. (# pending)
- Authorship technologies. (# 10,657,484), 2020.
- Kinetic-based tool for biometric identification, verification, validation, and profiling (# 9530,049), 2016.
- Document categorization and evaluation via cross-entrophy[*sic*] (# 6,397,205), 2002.

BOOKS

- Juola, Patrick, *Principles of Computer Organization and Assembly Language*. Upper Saddle River, NJ: Prentice-Hall, 2007.
- Juola, Patrick, *Authorship Attribution*. Delft: NOW Publishing, 2008.
- Juola, Patrick and Steve Ramsay, *Six Septembers: Mathematics for Humanists*. Lincoln, NE: Zea Books, 2017

SOFTWARE DEVELOPED

- 2017: ENVELOPE. Envelope is an extension of the JGAAP software package to handle authorship verification (a subclass of authorship attribution where only one candidate author is available and the desired answer is simply "yes" or "no").
- 2004: JGAAP (Java Graphical Authorship Attribution Processor). JGAAP is one of the most flexible and most widely used software for the attribution of the authorship of texts. Now (2021) in version 8.1.

- 1995: PGPfone Radio Alphabet. A biometric word list, used to validate data bytes using spoken English words (and by extension, using the speaker's voice as a security feature). See associated Wikipedia article for technical details.

EXTERNAL SERVICE

Academic Conference: Panelist
2014: The Riddle of Literary Quality Mid-Term Meeting, The Hague, Netherlands (International).
2014: Data Analytics: Opportunities and Challenges for UK and US Research Workshop at the University of Maryland, College Park, Maryland (International).

Board Member: Advisory Board
2018 – 2021: AAFS Standards Board Forensic Document Examination Body (National).

Board Member: Board of Trustees
2000 – 2012: International Quantitative Linguistics Association (International).
1999 – 2012: New Methods in Language Processing (International).

Chair: Conference / Track / Program
2019: 2019 Association for Computers and Humanities/Keystone Digital Humanties, Pittsburgh, Pennsylvania (International).
2004: Ad-hoc Authorship Attribution Competition (International).

Reviewer – Grant Proposal Related to Expertise
2011 – 2012: National Science Foundation (National).
2007 – 2012: National Endowment for the Humanities (National). 2003 – 2011: National Science Foundation (National).

Member: Committee/Task Force
2003 – 2012: Digital Humanities Development Consortium (International).
2003 – 2012: TADA (Text Analysis Developers Alliance) (International).
2010: ESSLLI 2010 Workshop on Computational Stylistics (International).
2003: QUALICO-2003 (International).

Officer: Organization / Association
2021: AAFS Standards Board Forensic Document Examination Body (National). Secretary